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Title: "A WHEEL"

5 The present invention relates to a wheel, particularly for use on vehicles, which is made from a stamped material and has a esthetics similar to that of wheels made from light-metal alloys by casting, as well as a disc for use on the aimed wheel.

**Description of the Prior Art**

10 Wheels designed for use on vehicles, particularly automotive vehicles, may be classified into two main categories, according to their manufacture process: wheel made from a stamped material and wheels made from light-metal alloys by casting.

15 Although the wheels made from a stamped material are easy to manufacture and have a low cost per unit, they have the drawback of not presenting an attractive design, so that their use is limited to low-cost vehicles or commercial utility/commercial vehicles, for which the esthetic factor is not of great importance. The wheels made from light metal are more flexible with regard to working-out and variation in design, thus being esthetically more attractive. However, they are expensive, their price being usually prohibitive for some segments of the automotive market.

20 The wheels made from a stamped material (usually carbon steel) from the prior art comprise a substantially cylindrical or truncated-cone-shaped rim and a substantially circular wheel disc, rigidly associated to each other, usually by welding, although one often uses screws, rivets, etc. as well. The stamped wheels may be subdivided into two types, according to their constructive form, which are the following.

25 A first type of stamped wheel is formed by a rim having two opposed end regions, or flanges, which define the region where the diameter of the wheel is maximum. The flanges are protuberant, have a substantially curved "J"-shaped or "J"-shaped profile, and define a groove for fixing a tire. These wheels are called conventional stamped wheels.

30 A second type of stamped wheel comprises a rim having only one wheel flange, the other flange being an integral part of the wheel disc. Again, the disc flange and rim flange define the region where the wheel di

is maximum; thus, the disc define the maximum wheel diameter on its flange. These wheels are known as Integrated wheels and have the advantage of enabling one to achieve more attractive and elaborate designs, while keeping the manufacture cost low.

5                    However, there are some problems associated with the integrated wheels, such as: a greater difficulty in achieving symmetry and alignment of the wheel; a design still inferior to that of the wheels made from light-metal alloys; the need for greater accuracy in the manufacture; a little higher price per unit, etc.

10                   Document EP A 0768191 (Porsche AG) discloses a wheel for a motor vehicle having a rim spider with air openings and a rim wheel connected with the spider. The wheel comprises at least two shell parts (rim spider and wheel) that are assembled to form the wheel. Each one of the components have an inner and a outer wall. In the area of the air openings, spider and wheel are connected with one forming hollow spokes.

15                   This wheel was developed to be used on high performance vehicles, such are sport cars, and its manufacturing cost is very high. The advantages of this wheel are, mainly, reduced weight due to the existence of hollow spokes, aggressive appearance and efficiency in the cooling of the brake system of the vehicle thus equipped.

20                   US 6,234,581 (Porsche AG) and US 6,152,351 (Porsche AG) refers to a wheel and to a process for manufacturing a wheel for a motor vehicle that is very similar to the wheel defined in the EP A 0768191. Hence, they refer to a wheel to be used on high performance vehicles with a very high manufacturing cost.

#### 25                   **Objectives of the Invention**

                    An objective of the present invention is to provide a stamped wheel, particularly for use on automotive vehicles, which is esthetically as attractive to the consumer as the wheels made from light-metal alloys, more flexible with regard to the options of design than the integrated wheels, and has the same low manufacture cost of the stamped wheels. The process of welding the wheel disc to the rim may be carried out with existing manufac

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ture equipment, thus demanding little or no investment in purchasing a new equipment for the production line.

Another objective of the present invention is to provide a wheel disc for use on the above-described wheel.

**5 Brief Description of the Invention**

The objectives of the present invention are achieved by a wheel, particularly for use on automotive vehicles, formed by associating a substantially cylindrical wheel rim and a substantially circular wheel disc to each other, the wheel rim comprising at least one flange, the wheel disc comprising at least one through bore having at least one projection which cooperates with the rim and a substantially annular end region that defines a first contact surface. The first contact surface of the disc cooperates with the rim at the end of the flange.

The main advantages of the present invention, among other

equally relevant advantages, are the possibility of making feasible a stamped wheel having the positive points of the conventional and integrated stamped wheels (such as the ease of obtaining symmetric and aligned wheels, low manufacture cost per unit, more attractive and more elaborate esthetics) and  
5 presenting a wider variety of design options than the integrated wheels, in addition to having an appearance equivalent to that of a wheel cast from light-metal alloys.

#### Brief Description of the Drawings

10 The present invention will now be described in greater detail with reference to an embodiment represented in the drawings. The figures show:

- Figure 1: a perspective view of a first constructive variation of the wheel object of the present invention;
- Figure 2: a perspective back view of the wheel illustrated in figure 1;
- 15 - Figure 3: a perspective view of a second constructive variation of the wheel of the present invention;
- Figure 4: is a perspective back view of the wheel illustrated in figure 3;
- Figure 5: a schematic cross-section view of the wheels illustrated in figures 1 – 4;
- 20 - Figure 6: a perspective view of a wheel disc of the wheel object of the present invention;
- Figure 7: a perspective view of a third constructive variation of the wheel object of the present invention; and
- 25 - Figure 8: a schematic cross-section view of the wheel illustrated in figure 7.

#### Detailed Description of the Figures

According to a preferred embodiment and as can be seen from figure 1, the wheel 1 of the present invention has a wheel rim 2 associated to  
30 a wheel disc 3.

The substantially cylindrical rim 2 is preferably made from carbon steel and has at least two end regions 4, named flanges, which consti-

tute the regions where the wheel diameter is maximum. The flanges 4 have a free end 5 projecting from the rim 2, substantially perpendicular thereto, defining a substantially "γ"-shaped or "J"-shaped profile. The flanges 4 define a substantially U-shaped intermediate region 7, configuring a channel for fixing a tire (not shown).

Preferably, a bore 8 is provided for placing a valve to control the inflation of the tire between one of the end regions 4 of the wheel 2 and the intermediate region 7, although this bore may also be positioned at any other point in the rim 2 wall.

The wheel disc 3 is substantially circular shape, is preferably stamped from carbon steel and comprises a first central region 31, a second intermediate region 32 and a third external region 33, as can be seen in figure 5.

The first central region 31 is substantially circular, preferably has a central bore 14, in which the tip of the vehicle axle is accommodated, and at least two adjacent bores 12 to fix the wheel 1 to the wheel hub of the vehicle (not shown), which is preferably effected by screwing.

The second substantially annular intermediate region 32 projects from the first central region 31, being concentric with the latter. The second intermediate region 32 has at least one through bore in the form of a brake-ventilation window 16. Usually, the ventilation windows 16 have the double objective of ventilating the brakes and improving the esthetics of the wheel. In the present invention, the ventilation window 16 has a new additional function that will be explained later.

The third external region 33 projects from the second intermediate region, is annular in shape and concentric with said first and second regions 31, 32 of the disc 3. This region defines the end of the disc 3, at which there is a first contact surface 20. The wheel disc 3 is worked out in such a way that this first contact surface 20 cooperates with the rim 2, almost touching it or slightly touching it, and gives the impression that the wheel 1 is a single piece, like the integrated wheels and the wheels made from light-metal alloys.

Preferably but not compulsorily, a tear 9 is provided in the external region 33, which overlaps the bore 8 of the wheel rim, allowing a tire-inflation valve (not shown) to pass.

In the preferred embodiment, the ventilation windows 16 are substantially trapezoidal in shape, comprising two walls 34 arranged radially with respect to the center of the disc 3, a first wall 35 that is substantially perpendicular to the radius of the wheel disc 3 and semicircular, located substantially close to the first central region 31, and a second wall 36 that is also substantially perpendicular to the radius of the disc and semicircular and is located substantially close to the third external region 33.

The second concentric wall 36 has a projection 37 facing the internal surface of the disc, that is to say, the one facing the wheel hub of the vehicle, this projection defining a second contact surface 21 between the wheel disc 3 and the rim 2. This second contact surface 21 is only present in the windows 16. Preferably, the projections 37 are substantially in form of an annular segment, but they may be in any other shapes, as long as they are functional.

Evidently, the window 16 may have other shapes than the trapezoidal one, for example, circular, triangular, hexagonal, etc. However, at least the wall (or a part of it) that is located in the external region of the wheel disc has to present a recess facing the wheel hub defining a contact surface with the wheel rim, exactly as described in the preceding paragraph.

As shown in figures 5 and 8, when the rim 2 and the wheel disc 3 are associated, the first contact surface 20 virtually or slightly touches the rim 2 at a point substantially close to the flange 4 or, alternatively, at the free end of the flange, and the second contact surface 21 cooperates with the rim 2, touching it at a point substantially located in the intermediate region 7 thereof. A small cavity 23 is formed between these two contact regions, the walls of which are defined by the rim 2 and by the disc 3.

In the first and second constructive embodiments of the wheel 1, the fixation of the disc 3 to the rim 2, which is effected by welding, occurs only on the second contact surfaces 21, as can be seen in figures 2, 4 and 5.

Since the fixing welding 40 is carried out in the back portion of the wheel disc (facing the wheel hub), and also due to the configuration of the front surface of the wheel disc, which virtually touches the flange 4, the wheel 1 has a more elaborate finishing than the stamped wheels from the prior art, giving  
5 the impression that the wheel is a single piece, that is to say, the impression that the rim and the disc are continuous.

Due to the projections 37 of the second walls 36 of the windows 16, which touch the rim in homogeneous way, and also due to the first contact surface 20, defined by the third external region 33, a natural centering  
10 occurs between the disc and the wheel rim, so that there is no great difficulty in manufacturing a perfectly centered wheel 1. This characteristic imparts to the invention a great advantage over the integrated-type stamped wheels, the perfect centering of which is somewhat difficult to achieve.

In addition, generally, the larger the extent of the second concentric wall 36 of the ventilation window 16 (and consequently the projection 37),  
15 the lesser the number of windows in the disc 3. In this way, the contact surface 21 will be larger and, as a result, the area available for fixing the rim 2 to the disc 3, thus imparting more strength to the wheel 1, as can be seen from a comparison of figures 2 and 4.

20 Figures 7 and 8 show a third constructive embodiment of the wheel of the present invention, in which the first contact surface 20 touches the end of the flange 4 of the rim 2. In this embodiment, in addition to the fixing welding 40 on the second contact surface 21 described above, the first contact embodiment 20 is also fixed to the flange 4 by means of a filling  
25 welding 41. This effect is achieved thanks to the constructive geometry of the disc 3, conceived for said surface 20 to touch the end of the flange 4. Evidently, one may conceive any variations of the disc 3, as long as they will enable its surface 20 or an adjacent region to touch the flange.

At least two additional steps in the manufacture of this wheel  
30 should be foreseen: a step for welding the first contact surface 20 to the flange 4 of the wheel 1, and a step for finishing the same welding, for instance, by machining.

Unlike the fixing welding 40, the filling welding, which is part of the finishing steps, has the function of improving the appearance and finish of the wheel and enhancing the impression that the wheel 1 is made from light-metal alloys, although this ends up by increasing the strength of the wheel 1, even if in a reduced way.

Moreover, the filling welding can prevent infiltration of moisture into the cavity 10, thus prolonging the useful life of the wheel and preventing possible corrosion problems:

Evidently, one may foresee other filling means than the welding 41, for example, glue, expanded foam, or any other material that has adhesive properties.

One may further foresee the filling welding, or the other means, on any wheel built in accordance with the teachings of the present invention, and not only in the third constructive embodiment described above.

A preferred embodiment having being described, it should be understood that the scope of the present invention embraces other possible variations, being limited only by the contents of the accompanying claims, which include the possible equivalents.